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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,459	11/07/2001	Hariprasad Sreedharamurthy	MEMC 99-1250/2441.1	1061

321 7590 01/14/2004

SENNIGER POWERS LEAVITT AND ROEDEL
ONE METROPOLITAN SQUARE
16TH FLOOR
ST LOUIS, MO 63102

EXAMINER	
SONG, MATTHEW J	
ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 01/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/039,459	SREEDHARAMURTHY ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) *15-33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. This application contains claims 15-33 drawn to an invention nonelected with traverse in Paper the paper filed on 11/21/2003. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holder et al (WO 99/66108).

Holder et al discloses an Czochralski apparatus for preparing silicon crystals with reduced metal content, note entire reference, comprising graphite hot zone structures: a heater **16**, susceptor **14**, thermal shield **18**, heat reflectors, pure tubes, insulation and view port channels and a crystal growth chamber **4**. Holder et al also discloses the graphite utilized to construct the hot zone structures is generally at least 99.99% pure graphite with less than about 5 ppm, where the particle generation during high temperature heating decreases as the purity of the graphite increases (pg 7), this is a teaching that purity is a result effective variable. Holder et al also discloses a protective coating of silicon carbide about 75-150 micrometers thick covering the

entire surface to grown directly on the graphite components covering the entire surface to maximize protection comprises 99.99% silicon carbide and 0.01% silicon. Holder et al also teaches the silicon carbide coating provided by industry contains about 1 ppm iron (pg 3).

Holder et al discloses a graphite substrate with a concentration of iron no greater than 5 ppm and a silicon carbide coating, thereon. Holder et al does not disclose a substrate with a concentration of iron no greater than $1.5x\ 10^{12}$ atoms/cm^3 or an iron concentration of the protective layer is no greater than $1.0x10^{12}$ atoms/cm^3. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Holder et al by using a substrate with a reduced iron impurity concentration because purifying an old product is held to be obvious (MPEP 2144.04 VII). Also note, the mere purity of a product, by itself does not render the product unobvious (Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989).

Referring to claim 7-8, Holder et al discloses a layer thickness of 75-125 micrometers.

Referring to claim 9, Holder et al discloses covering the entire surface to maximize the effectiveness.

4. Claims 10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holder et al (WO 99/66108) in view of Falster et al (US 5,919,302) and Kim et al (US 5,942,032).

Holder et al discloses all of the limitations of claim 10, as discussed previously, except the structure component reaches at least 950°C for at least about 80 hours and is within 3 cm to about 5 cm of the silicon single crystal or the silicon melt.

In a Czochralski method for forming low defect density silicon, note entire reference, Falster et al teaches a ingot is cooled from a solidification temperature to a temperature in excess

of about 1050°C over a period of at least about 75 hours and control of the cooling rate can be achieved by using any means currently known in the art for minimizing heat transfer, including the use of insulators, heaters, radiation shields and magnetic fields (col 9, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Holder et al with Falster et al to form an ingot having an axially symmetric region, which is substantially free of defects (col 3, ln 1-67).

In a single crystal pulling apparatus, note entire reference, Kim et al discloses a lower heat shield **42** is about 50-60 mm above the surface of a the melt in a crucible (col 9, ln 1-67) to prevent heat from radiating from the side walls of the crucible to a ingot except in the space between the bottom of the lower heat shield and the surface of the melt. Kim et al also discloses an upper heat shield **36**, an intermediate heat shield **40** and vertically arranged heating panels **24**, where the heating panel which heats the interior of the crystal puller reads on applicant's upper heater, composed of graphite and the intermediate heat shield supports the upper heat shield (col 6, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Holder et al and Falster et al with Kim et al to inhibit agglomeration of defects in the crystal growth process (col 3, ln 1-67).

5. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holder et al (WO 99/66108) in view of Falster et al (US 5,919,302) and Kim et al (US 5,942,032) as applied to claims 10 and 14 above, and further in view of Luter et al (5,922,127).

The combination of Holder et al, Falster et al and Kim et al teaches all of the limitations of claim 11, as discussed previously, except a lower heat shield reflector, a lower heat shield outer reflector, a lower heat shield insulation layer

In a crystal pulling apparatus, note entire reference, Luter et al discloses a heat shield **40** comprising a graphite insulation layer **42** sandwiched between an inner **42** and outer reflector **46.** It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Holder et al, Falster et al and Kim et al with Luter et al to distribute defects more evenly throughout the ingot to improve the overall quality of the ingot (col 6, ln 50-67).

Referring to claim 11, the combination of Holder et al, Falster et al, Kim et al and Luter et al teaches inner **42** and outer reflector **46**, a upper heat shield **36**, an intermediate heat shield **40**, lower heat shield **42**, an upper heater **24**, where the intermediate heat shield provides support for the upper heat shield, which acts as an insulation shield.

Referring to claim 12-13, the combination of Holder et al, Falster et al, Kim et al and Luter et al teaches a silicon carbide layer covering graphite components in a hot zone, including reflectors, insulation, heaters and heat shields.

Response to Arguments

6. Applicant's argument that the crystal puller of the present invention has a different utility than that disclosed by Holder is noted but is not found persuasive. Applicant uses a graphite substrate havinga concentration of iron no greater than about $1.5x10^{12}$ atoms/cm^3 and a protective layer of silicon carbide having a concentration of iron no greater than about $1.0x10^{12}$

atoms/cm^3. The materials used by applicant are used in a crystal pulling apparatus for producing a silicon single crystal grown by the Czochralski process, note instant claim 1. Holder et al teaches a silicon carbide coating over graphite parts is sued to reduce the amount of undesirable contaminants entering the silicon melt and/or growing crystal (pg 3) and the apparatus is for producing a silicon single crystal having a reduced amount of metal contamination by the Czochralski process (pg 4). Therefore, the graphite substrate and silicon carbide coating of Holder is used in a Czochralski process for producing a silicon single crystal with reduced metal contamination, as applicant and has the same utility.

Applciant's argument that Holder et al does not suggest the particular form is noted but is not found persuasive. Applicant alleges that the teaching of Holder et al does not suggest reducing the concentration of metal containments to unconventional levels, such as less than about $1.5x10^{12}$ atoms/cm^3. Holder et al discloses the graphite contains **less than** about 5 ppm total metals such as iron and as the purity of the graphite increases the amount of particles generation decreases (pg 7, ln 10-20). Therefore, Holder et al does suggest lowering the concentration of metals such as iron to decrease particles generation.

Applicant's argument that Holder et al does not discloses any method for producing a structural component comprising a graphite substrate and a silicon carbide substrate having the claimed iron concentration is noted but is not found persuasive. The MPEP 2144.04 VII states "Factors to be considered in determining whether a purified form of an old product is obvious over the prior art include whether the claimed chemical compound or composition has the same utility as closely related materials in the prior art, **and** whether the prior art suggests the particular form or structure of the claimed material **or** suitable methods of obtaining that form or

structure". Therefore, because Holder et al does teach a composition with the same utility and suggests using purer forms to reduce particle generation; a teaching of a suitable method of obtaining that purer form is not required, as suggested by applicant. The requirement of a prior art suggestion of a particular form or structure **or** suitable methods of obtaining that form is referred to in the alternative and both are not required to show the purified form of the old composition is obvious. A proper prima facia case of obviousness has been established because the prior art composition has the same utility and suggests using purer forms to reduce particle generation. Furthermore, Larkin et al teaches a method of forming silicon carbide having a non-crystal element concentration of less than about $8x10^{13}$ cm^{-3} (claims 18, 21 and 23), which is a teaching of obtaining a purified silicon carbide crystal within the claimed range.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tojo et al (JP 11-116344) teaches a SiC product, which has impurity concentrations comprising a Fe concentration of less than 0.5 ppm (Abstract).

Nishimura et al (JP 02-192413) teaches a method of eliminating impurities in a graphite member (Abstract).

Nadkarni et al (US 5,080,879) teaches a method of purifying silicon carbide of impurities, such as iron, note entire reference.

Tanaka et al (US 4,753,763) teaches a method of purifying silicon carbide (Abstract).

Larkin et al (US 5,709,745) teaches a method of forming silicon carbide having a non-crystal element concentration of less than about $8x10^{13}$ cm^{-3} (claims 18, 21 and 23).

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS

SUPERVISOR
NADINE G. NORTON
PRIMARY EXAMINER